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Donkey welfare assessment in Algeria

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Declaration

I hereby declare that I have done this thesis entitled “Donkey welfare assessment in Algeria” independently, all texts in this thesis are original, and all the sources have been quoted and acknowledged by means of complete references and according to Citation rules of the FTA.

In …… date ……

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Anežka Malá

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Abstract

The donkey holds a distinctive position among the first domesticated animals, providing indispensable services in the form of transportation and draught for owners in low- to middle-income countries. Despite the pivotal roles played by donkeys, they often suffer from poor welfare. This study aimed to evaluate welfare and identify associated problems and potential solutions in northeast Algeria using the Standardised Equine-Based Welfare Assessment Tool (SEBWAT). The parameters encompassing general health, behaviour, and living/working conditions were systematically evaluated. A total of 78 donkeys, categorised into three groups based on usage (hobby, transport, and as a meat source (donkeys seized from smuggling operations and later used for feeding zoo animals), underwent assessment. Serious welfare problems have been identified within each of the categories, including poor body condition, health problems, and negative approach to people, whereas the seized donkeys used as a meat source suffered the highest (i.e., poorest) final score in all the parameters. The areas where improvement of living conditions is highly necessary were identified, including water, food, shade, and health care accessibility, fitting of harnesses and ropes used for animal immobilisation, and approach of the owners towards the animals. Collaborative efforts involving owners and handlers are crucial to improving their attitudes and practices towards donkeys.

Key words: donkey, welfare, Algeria, work, health

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1. Introduction

Animal welfare has been widely discussed and improved over the last fifty years in developed countries (Broom 1988), however, there are many areas and regions in the world where animal welfare is neglected or not obtaining significant attention. One of the animal species where welfare problems are identified, but often not treated sufficiently is the domestic donkey (*Equus asinus*). Therefore, I decided to use the opportunity and study donkeys (and horses for comparison) welfare conditions in the region of North Africa, Algeria specifically, where any scientific research is lacking up to date. Interest in these topics in donkeys is growing but is far from reaching the level of other livestock.

There are more than 40 million donkeys in the world, 14 million of them live in Africa, approximately 80,000 donkeys inhabit Algeria, predominantly serving as working animals (FAO 2021). A limited number of zoological studies focusing on this species have been undertaken in the region. Recent morphological studies have revealed a remarkable heterogeneity in both morphological and phenotypic characteristics among Algerian domestic donkeys (Labbaci et al. 2018, 2022). These studies described the Algerian population of donkeys, mainly the size and colouration of the animals (Labbaci et al. 2018; Ayad et al. 2019; Hannani et al. 2020; Labbaci et al. 2022). Hannani et al. (2020) documented variations in the occurrence of back stripes and zebra marks. Additionally, genetic analyses have traced the lineage of Algerian donkeys to an ancestral origin within the African Wild Ass (Hannani et al. 2020). However, welfare-focused studies are lacking.

The domestic donkey holds a distinctive position among the first domesticated animals, providing indispensable services in the form of transportation and draught for owners in low- to middle-income countries. While existing literature acknowledges its crucial role (Starkey 2000; Starkey & Starkey 2004; Pritchard et al. 2018; Brooke 2019; Geiger et al. 2020), research efforts dedicated to understanding and exploring the donkey's multifunctional contributions are disproportionately scarce compared to other domesticated species. Furthermore, donkeys play a significant role in generating income through various means, including the sale of dried dung, utilisation in agriculture, participation in public transport, and involvement in industrial activities such as brick

production and mining (Starkey 2011; Valette 2015; Geiger et al. 2020). Additionally, they are available for hire, as indicated by previous findings (Braimah & Mac Akampirige 2017; Tuaruka & Agbolosu 2019; Geiger et al. 2020). Recently, there has been a notable increase in China's demand for donkey products like E-Jiao, a gelatinous extract obtained from boiled donkey skins, used as a tonic or elixir, and showing links with the trafficking of timber products of conservation concern using the same trade network (Davis 2019; Su et al. 2023).

Most donkeys serve as working animals, mainly in developing countries because they can survive on fewer resources, can adapt to harsher conditions, are more economical than horses and are preferred for their intelligence and easy training (Inns 1980; McLean 2010; Blakeway 2014). Also, they are highly resistant to heat, dehydration, and diseases, which makes them suitable for semiarid climates (Smith & Pearson 2005). Donkeys are used worldwide, in North Africa, they usually transport water in villages located in dry areas, where people rely on water from natural sources (watering holes), often far from their homes. Non-Working donkeys can sometimes be used for breeding or leisure (Adam et al. 2022), old individuals are sold or given to zoos as a meat source for zoo animals (McLean & Gonzales 2018). Because of insufficient infrastructure in rural areas, the donkeys are essential also as a means of transport for people, food, and other farm facilities (Starkey 2000; Starkey & Starkey 2004). There are also donkeys kept for recreation, as guards or companions (McLean & Gonzales 2018).

Another use of donkeys is for meat and skin production in Asia and Africa, where there is increasing interest about management of these animals, and sales to the meat and skin industry are common, especially in African countries like Ethiopia, Niger, and Nigeria (Yang et al. 2011; Kriel 2017; Marchis et al. 2017; The Donkey Sanctuary 2017; Valle et al. 2017). The excessive demand for donkey skins for E-jiao has resulted in an illegal trade in donkeys (Goodrum et al. 2022). In these days there are some restrictions or bans of slaughterhouses in Burkina Faso, Ghana, Chad, Ivory Coast, Kenya, Mali, Senegal, Tanzania, Zimbabwe and for export of skins to China in Botswana, Nigeria, Senegal, South Sudan, Sudan, and Uganda (PeTA 2020; Brooke 2022, 2023; Goodrum et al. 2022). But still many slaughterhouses are used elsewhere in Africa, raising questions about transport, spread of diseases such as glanders, African

horse sickness, equine infectious anaemia or equine piroplasmosis, as well as care in facilities and processing methods like slaughter with captive bolt guns or slaughter with axes in the field (Mshelia et al. 2017, The Donkey Sanctuary 2017). Commercial production of donkey milk for consumption is growing in Italy, Serbia, and Turkey (Salimei et al. 2004), while non-commercial production occurs in Eastern Europe. Donkeys used for milk production often face several challenges that can affect their health and the quality of milk. Some of these challenges are lack of vaccination and deworming, poor housing and feeding which can lead to poor body condition and health problems (Valle et al. 2017; Conte & Panebianco 2019).

The growing market is causing more frequent transport of animals for long distances in many countries in Africa and South America, such as Brazil (Salimei et al. 2004; The Donkey Sanctuary 2017). During transports, animals do not have access to water, food, or veterinary care, and they suffer health problems such as wounds from rope on legs, lameness, rectal prolapse or even death (Yang 2011; Mshelia 2017; The Donkey Sanctuary 2017).

1.1. Donkey welfare

The diverse use of donkeys encompasses many issues that need to be addressed to improve the lives and welfare of donkeys in developing countries. In 2018 the WOAH (OIE) proposed new definition of animal welfare that it is “the physical and mental state of an animal in relation to the conditions in which it lives and dies” (WOAH 2018). This current state represents subjective experiences, including positive experiences like saturation, associate, behaviour including curiosity or playfulness and negative experiences such as hunger, thirst, pain or fear and loneliness. As a result, it shows indirect indicators caused by subjective perception, and the welfare state can be continuously rated from very bad to very good (Hemsworth et al. 2014).

Different parameters, such as emotional or clinical, can be distinguished to assess these experiences or indicators. Emotional parameters are difficult to measure for animals, but it is possible to evaluate them through behavioural responses such as response to the researcher: movement forward, sniffing, avoidance, or disinterest (Dawkins 2006; Hemsworth et al. 2014; Geiger & Hovorka 2015). Methods examining

negative experiences are based on behaviour and physiology (Boissy et al. 2007; Mendl et al. 2009), but tools to determine positive experiences are still lacking even though research is emerging on rewarding behaviour from an animal perspective (Panksepp 2005; Burgdorf and Panksepp 2006; Boissy et al. 2007). Clinical or physical parameters include body condition score, checking the gait for signs of lameness, hoof abnormalities, detailed body inspection (wounds, scars), eye abnormalities, discharges, and coat condition (Wemelsfelder & Mullan 2014; Geiger & Hovorka 2015). The description of the environment is not the current state of the animal and, therefore, cannot be considered as an indicator of welfare but can only indicate risks of welfare deterioration (Blokhuis et al. 2003; Whay et al. 2003).

Various welfare protocols for equids are used for the assessment of the welfare and management of animals. Most of the protocols are designed for use in developed countries, and the purpose of the protocol differs. Qualitative Behaviour Assessment (Wemelsfelder 2007; Minero et al. 2016) is used for behavioural measures, while another six equid welfare assessment protocols have been proposed for evaluating the actual welfare state: Australian Welfare Protocol (AHIC 2011), Assessment Protocol for Horses (Wageningen UR Livestock Research 2011), Animal Welfare Indicators (AWIN) Welfare Assessment Protocol for Horses (Minero et al 2015a), AWIN Welfare Assessment Protocol specifically designed for donkeys (Minero et al 2015b), Horse Welfare Assessment Protocol (HWAP, Viksten et al. 2017), and Standardised Equine-Based Welfare Assessment Tool (SEBWAT, Sommerville et al. 2018). Protocols for developing countries include The Equid Assessment Research and Scoping tool (EARS) developed by Raw et al. (2020), which was used in Nepal (Norris et al. 2020), in rural communities of Portugal and Spain (Haddy et al. 2020a), and Mexico (Haddy et al. 2021). Other assessments were applied in South America (De Aluja 1998; Tadich et al. 2008; Burn et al. 2010a; Luna et al. 2017; Pritchard et al. 2018), Asia (Pritchard et al. 2005, 2018; Burn et al. 2010a; Rayner et al. 2018) and Africa (Pritchard et al. 2005, 2018; Burn et al. 2010a; McLean et al. 2012; Ali et al. 2016; Aliye et al. 2022).

In this study, the Standardised Equine-Based Welfare Assessment Tool (SEBWAT) protocol was employed. This protocol has been in practical use since 2012 by a non-governmental organisation operating in low- to middle-income countries for a span of six years (Sommerville et al. 2018). Originally derived from the Working

Equine Welfare Assessment by Pritchard et al. (2005), the SEBWAT protocol was revised from its original version by Brown (2012). It serves as a comprehensive tool focusing on assessing the general welfare conditions of working equids, encompassing forty animal-based measures relevant to their well-being. This protocol has been utilised or adapted in studies conducted in developing countries (Burn et al. 2010b; Brown 2012; Sommerville et al. 2018; Shah et al. 2019; Drought et al. 2023; Seck et al. 2023). Popescu & Diugan (2013, 2017) have also adapted this protocol for use in Romania, the country with the highest number of working equids in the European Union (FAO 2021).

Despite the pivotal roles played by donkeys, they often suffer from poor welfare. Researchers have reported welfare problems in all the African regions, including Northern Africa (Pritchard et al. 2005; Burn et al. 2010a; Ali et al. 2016), Western Africa (Burn et al. 2010a; McLean et al. 2012; Tuaruka & Agbolosu 2019; Seck et al. 2023), Eastern Africa (Nengomasha et al. 1997; Saul et al. 1997; Wold et al. 2004; Curran et al. 2005; Tesfaye & Curran 2005; Burn et al. 2010a), and Southern Africa (Geiger & Hovorka 2015). These problems encompass adverse environmental conditions (Pritchard et al. 2005; Burn et al. 2010a), excessive workloads (Gebresenbet et al. 2016; Farhat et al. 2020), improperly fitted harnesses (Wold et al. 2004; Curran et al. 2005; McLean et al. 2012), inadequate nutrition (Curran et al. 2005), and issues, coupled with a deficiency in knowledge regarding donkey breeding and behaviour, can result in compromised body condition (Geiger & Hovorka 2015), various dermal afflictions (Tuaruka & Agbolosu 2019), lameness (McLean et al. 2012), and abnormal behaviour, including avoidance, aggression, or apathy (Geiger & Hovorka 2015; Ali et al. 2016). Usually, there is no individual feeding regime in donkeys, in case of injury or sickness, the veterinarian is not called for treatment, only in case of free veterinary service provided by non-governmental organisations (Upjohn et al. 2014), e.g. the Society for the Protection of Animals Abroad. It is necessary to provide farmers with more knowledge about the care and work conditions for these animals. With appropriate care, donkeys can live longer and provide more opportunities for farmers (Wold et al. 2004).

2. Aims

The aim of this study was to utilise the SEBWAT protocol for the comprehensive evaluation of the overall health, behaviour, and physical well-being of donkeys in northeast Algeria. Subsequently, the study aimed to identify welfare problems and formulate effective strategies to enhance the overall quality of life for these animals.

3. Materials and methods

The literature review was conducted using scientific and scholarly publications. Specialized databases such as Google Scholar, Web of Science, ScienceDirect, Springer Link, among others, were utilized for the retrieval of relevant literature. This was achieved through the application of key words, such as donkey, welfare, Algeria, work, and health.

3.1. Study area

The study was conducted in May and June 2023 across twenty-one locations in the northeast part of Algeria, specifically in the provinces of Guelma, El Taref, and Souk Ahras (Figure 1). Data collection involved a systematic approach wherein localities were randomly selected for assessment. Utilizing a car for transportation, the research team traversed through the designated areas, engaging with local inhabitants to identify households owning donkeys. Upon encountering such households, individuals were approached and surveyed for their ownership of donkeys as part of the data collection process. This random sampling method ensured a representative sample of donkey owners across the study region, enabling a comprehensive assessment of donkey welfare in the targeted locations.

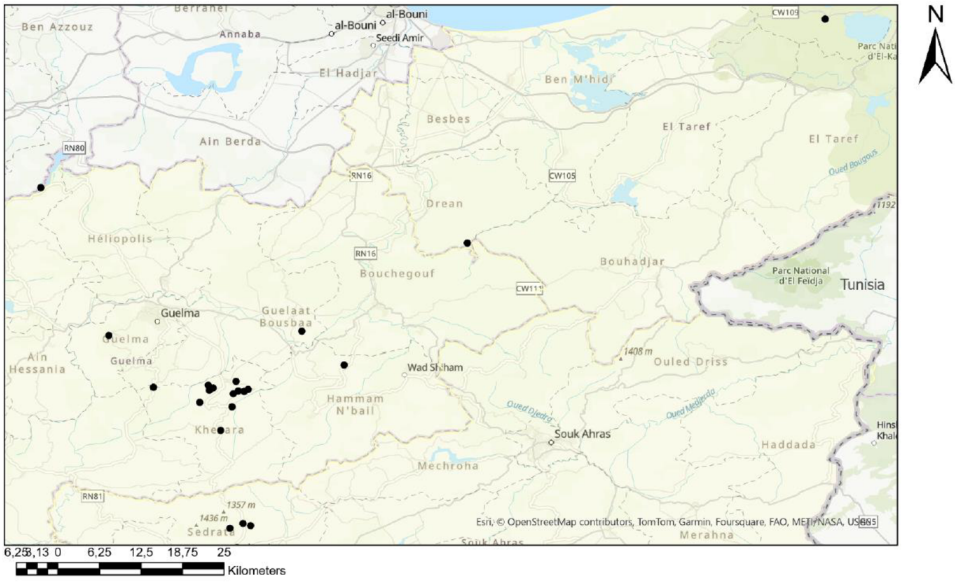

Figure 1. Locations where donkey welfare assessment was conducted.

3.2. SEBWAT protocol

The SEBWAT protocol involves the initial assessment of descriptors (Table SM1); animals were randomly selected and examined for any health and welfare problems. A single observer systematically recorded all measures using the complete SEBWAT protocol, allowing for a comprehensive evaluation within 5-10 minutes per animal (Sommerville et al. 2018). The animals were restrained, if possible, using a headcollar or halter and controlled by a handler. The protocol is designed to be as non-disruptive as possible and emphasises positive interactions from the handler through touch and verbal praise. If the animal showed signs of distress, any interaction leading to this response was immediately stopped. However, observations that could be made from a distance were still documented. Upon completion of the assessment, the evaluator could provide feedback to the owners about the animal's welfare. The scoring system for all measures predominantly followed a scale of 0-2 (0 = least severe; 2 = most severe), while some measures were binary (0 = not present; 1 = present). Thus, the protocol is designed to indicate good welfare conditions with low scores.

The assessment comprised six sections. The first one is dedicated to the basic characterisation of the scored animal (Table SM1), while the five main sections asses:

i. General health indicators (Table SM2), including body condition score (BCS), eye abnormality, nasal discharge, respiratory noise, diarrhoea and ectoparasites. The original SEBWAT criteria use the BCS scale (1 to 5); thus, very thin, and very fat (both situations are bad for the animal) would be scored differently, with a very thin animal getting the best welfare score. We modified this criterium on a 0 to 2 scale, with 0 = normal (BCS = 3), 1 = thin or fat (BCS = 2 or 4), and 2 = very thin or very fat (BCS = 1 or 5).

ii. Behavioural indicators (Table SM3), including reaction to a human, approach, chin contact test, tail tuck and spinal contact.

iii. Assessment of physical health (Table SM4), including checking the occurrence of lesions in various body regions (head and ears, neck, breast and shoulders, forelimbs, ribs and flank, withers and spine, girth and belly, hindquarters, hind limbs). For lip, knee, tail base and genital rectal lesions, only severity was recorded.

iv. Practice-induced conditions (Table SM5) were checked in different areas like tail, ear, and muzzle mutilations, firing, and hobbling or tethering.

v. Hoof health and gait (Table SM6), including gait, swelling, interference, hoof shape and quality. The scoring for mucous membrane state and frog condition was not obtained, as not all the animals could be closely approached and touched.

3.3. Adapted protocol

An adapted protocol, inspired by studies conducted in Wageningen UR Livestock Research (2011), Minero et al. (2015a, 2015b), Ali et al. (2016), and Norris et al. (2020), was developed to facilitate a more comprehensive evaluation of welfare, encompassing the following parameters (Table SM7):

i. Health indicators include coat health, coat cleanliness and mouth corners state.

ii. Working indicators (n = 21) include access to water during the working period, number of working hours per day, number of working days per week, rest breaks during the working day and access to shade during breaks in the working days.

iii. Housing indicators include access to water out of the working period, social interaction, housing regime, environment clean and free from hazards, dimensions of the stable/shelter, and clean dry comfortable area for resting.

Figure 2. Assessment of donkeys (Asma Maklouf 2023).

3.4. Statistical analysis

The five areas studied (general health, behaviour, body lesions, practice-induced conditions, and hooves and limbs) and the final SEBWAT score were initially tested for normality using the Kolmogorov-Smirnov test. Since none of them were normally distributed, the following analyses were designed according to this. Boxplots were built to show the partial and final scores, always with lower scores indicating better welfare. The Y-axis fits the minimum-maximum range of values for each score to make them visually comparable. Generalized Linear Mixed Models (GLMMs) with gamma distribution were created to analyse the effects of sex and type of use on each partial and the final SEBWAT score. The exact age was known just for 23 animals. Thus, the age effect was studied separately through Spearman´s correlation. In addition, Spearman´s correlations were used to among the 5 partial scores to detect interactions among them.

All the analyses were conducted in SPSS 29.0, except the heatmaps, which were done in RStudio using the ggplot2 package.

4. Results

In total, 78 donkeys (39 mares and 39 stallions) across 21 locations were assessed using the SEBWAT tool. These donkeys were used for different purposes, including hobby (n = 6), transport (n = 21), and as a meat source (n = 51). “Meat source” donkeys were seized from smuggling operations and after transport from the place of their origin were used for feeding the zoo animals. The identification of welfare issues was conducted through the assessment of both the animals and their environment, complemented by discussions with owners.

Figure 3 shows the welfare score for the five partial areas studied and the final SEBWAT score. Behavioural and hooves and limb issues showed the highest variability, with some animals reaching very high scores. On the opposite range were the body lesions and practice-induced conditions, which showed low values in general, and even several animals obtained the lowest score. In the middle, general health and final SEBWAT scores showed mid-low values but low occurrence of minimum scores.

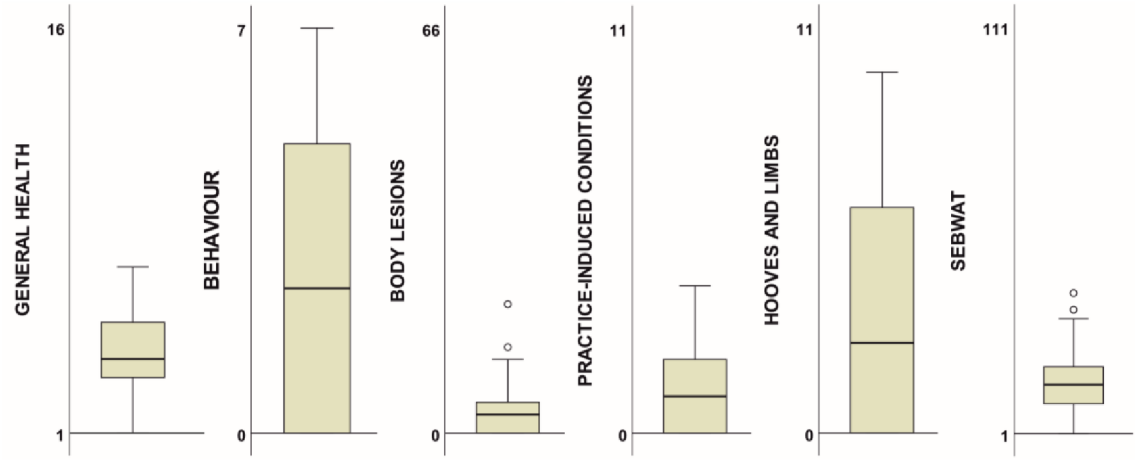

Figure 3. Welfare score for the five partial areas studied and the final SEBWAT score. The Y-axis fits the minimum-maximum range of values for each score to make them visually comparable.

The GLMMs (Table 1) showed no differences in the welfare scores between males and females. However, the type of use had important effects. Donkeys for hobby showed the lowest general health score (2.919±0.408) followed by donkeys for transport (3.358±0.255) and those for meat (4.269±0.206), being significantly different the pairwise comparisons hobby vs. meat (p=0.004) and transport vs. meat (p=0.007). The score for body lesions was significantly lower for hobby (3.891±1.217) and transport (3.602±0.600) than for meat (6.225±0.637; both p=0.004). Similarly, the final SEBWAT score was significantly lower for hobby (11.058±2.622) and transport (11.373±16.449) than for meat (16.449±1.337; p=0.070 and p=0.013, respectively). No correlation was observed between age and any of the studied welfare scores.

Table 1. General Linear Mixed Models showing the effect of type of use and sex on the partial and final SEBWAT welfare score of Algerian donkeys.

	Type of use	**Sex**
General Health	F=5.793; p=0.005**	F=1.556; p=0.216
Behaviour	F=1.157; p=0.311	F=1.144; p=0.290
Body Lesions	F=4.413; p=0.017*	F=0.459; p=0.501
Practice-Induced Conditions	F=0.897; p=0.416	F=0.187; p=0.667
Hooves and Limbs	F=0.361; p=0.699	F=0.296; p=0.589
SEBWAT	F=3.661; p=0.030**	F=0.553; p=0.459

* and ** indicate significant levels at <0.05 and <0.01, respectively.

The final SEBWAT score was well correlated with all the partial scores (Figure 4; general health, $\rho=0.440$, $p<0.001$; behaviour, $\rho=0.585$, $p<0.001$; body lesions, $\rho=0.730$, $p<0.001$; practice-induced conditions, $\rho=0.502$, $p<0.001$; hooves and limbs, $\rho=0.638$, $p<0.001$). Within the partial scores, significant correlations were detected between practice-induced conditions and body lesions ($\rho=0.460$, $p<0.001$), general health and behaviour ($\rho=0.383$, $p<0.001$), general health and body lesions ($\rho=0.289$, $p=0.010$), and behaviour and body lesions ($\rho=0.244$, $p=0.031$).

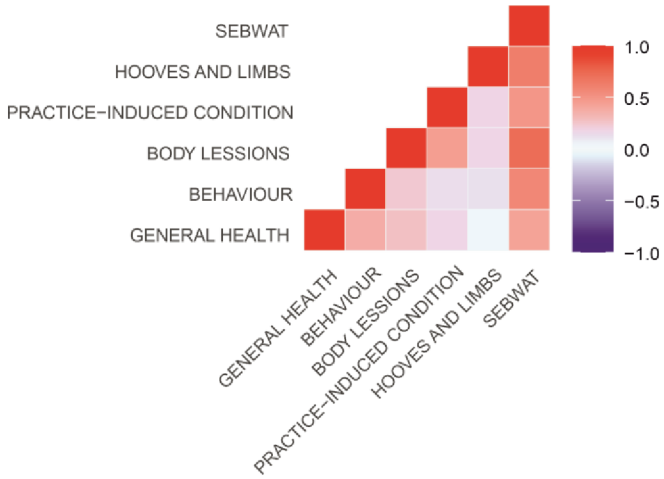

Figure 4. Heatmaps.

4.1. SEBWAT protocol

The examination of general health parameters revealed prevalent and widespread issues, notably concerning eye abnormalities (85.9% present), underweight body condition (62.8%), and the presence of ectoparasites (41%). Behavioural parameters (Table 2) in the study revealed noteworthy observations, with concerns identified in chin contact (39.7% avoidance), observer approach (25.6% negative), and tail tuck (25.6% present).

Table 2. Prevalence of behavioural issues detected after conducting the SEBWAT assessment.

Parameter	Positive	Neutral	Negative
General attitude	44.9%	29.5%	25.6%
Observer approach	44.9%	29.5%	25.6%
Chin contact	60.3%	N/A	39.7%
	No reaction	**No test**	**Yes**
Tail tuck	74.4%	N/A	25.6%
Spinal contact	59.0%	17.9%	23.1%

A detailed assessment of body lesions (Table 3) identified prevalent lesions, particularly in the head and ear area (35.9% healed). Additionally, the most severe lesions were observed in the foreleg (20.5% healed, 1.3% open, 1.3% deep) and hindquarters (14.1% healed, 1.3% deep) regions.

Table 3. Prevalence of lesions detected after conducting the SEBWAT assessment.

Body area	No lesion	Healed lesion	Open lesion	Deep lesion
Lip	82.1%	14.1%	3.8%	0
Head and ear	64.1%	35.9%	0	0
Neck	83.3%	16.6%	0	0
Breast and shoulders	85.9%	14.1%	0	0
Forelegs	76.9%	20.5%	1.3%	1.3%
Withers and spine	79.5%	20.5%	0	0
Ribs and flank	87.2%	12.8%	0	0
Girth and belly	89.7%	10.3%	0	0
Hindquarters	84.6%	14.1%	0	1.3%
Hindlegs	80.8%	19.2%	0	0
Knee	96.2%	3.8%	0	0
Tail base	89.7%	9.0%	1.3%	0
Genital or rectal	100%	0	0	0

Figure 5. Lesion on pelvis (Anežka Malá 2023).

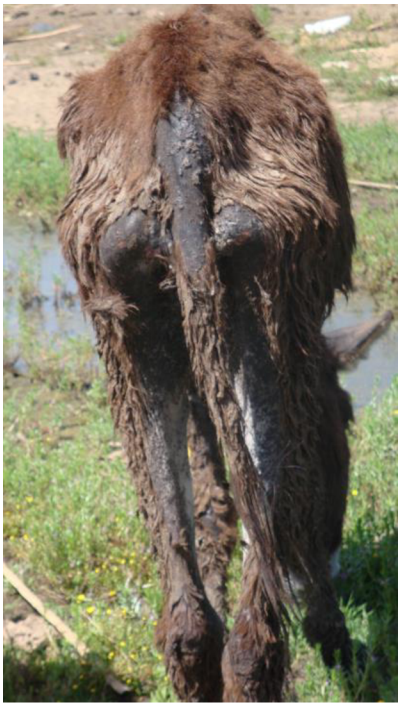

Figure 6. Lesions on hindquarters, legs, and tail (Anežka Malá 2023).

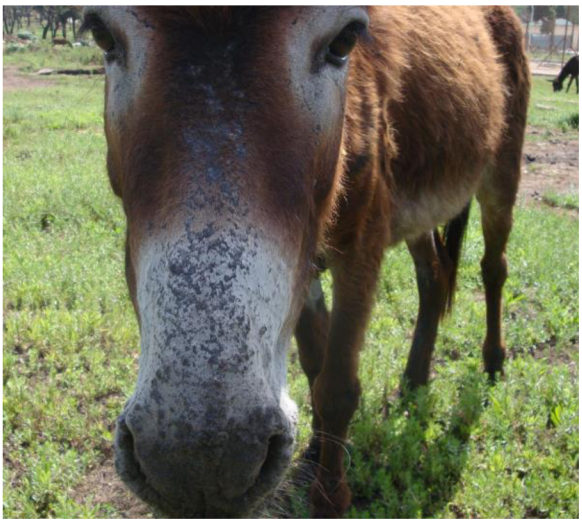

Figure 7. Lesions on head (Anežka Malá 2023).

This was followed by an evaluation of the practice-induced conditions, such as high numbers of muzzle mutilation (38.5% healed) and hobbling or tethering (15.4% healed, 9% open, 5.1% deep). Finally, the examination of hooves and limbs (Table 4) unveiled abnormalities in hoof shape and quality. Specifically, abnormalities were noted in the hoof shape of forelegs (7.7% one hoof abnormal, 39.7% both hooves abnormal) and hindlegs (9% one hoof abnormal, 29.5% both hooves abnormal), as well as in the hoof quality of forelegs (21.8% one hoof abnormal, 26.9% both hooves abnormal) and hindlegs (12.8% one hoof abnormal, 14.1% both hooves abnormal).

Table 4. Prevalence of gait and hoof health issues detected after conducting the SEBWAT assessment.

Parameter	**No abnormality**	**One limb/hoof abnormal**	**Both limbs/hooves abnormal**
Swelling forelegs	97.4%	1.3%	1.3%
Swelling hindlegs	95.0%	1.0%	4.0%
Interference forelegs	0	0	0
Interference hindlegs	0	0	0
Hoof shape forelegs	52.6%	7.7%	39.7%
Hoof shape hindlegs	61.5%	9.0%	29.5%
Hoof quality forelegs	51.3%	21.8%	26.9%
Hoof quality hindlegs	73.1%	12.8%	14.1%
	Not compromised	**Moderately compromised**	**Highly compromised**
Gait	96.1%	2.6%	1.3%

4.2. Adapted protocol

The health issues observed in the sampled animals were notably concerning coat health (52.6% unhealthy), coat cleanliness (20.5% dirty) and mouth corners (14.1% hard and 3.8% bleeding).

In working animals (n = 21), specific parameters were assessed, including access to water during work, number of working hours per day, number of days worked per week, rest breaks during working day and access to shade during breaks in working.

All working animals had restricted access to water during the working period, with two donkeys having no access at all. Rest breaks during the working day were observed in 57% of cases, but equipment removal during these breaks was lacking. All donkeys worked an average of 6 hours or less per day, except for one who worked 6 to 9 hours per day. A considerable proportion of working donkeys worked for seven days per week (52%). Access to shade during breaks in working hours was limited for 33% of animals and completely unavailable for 52%.

Housing conditions for all donkeys were assessed, including access to water in housing, housing regime, dimensions of the stable/shelter, presence of a clean, dry, comfortable lying area, environment clean and free from hazards, and possible social interaction. The majority of donkeys had limited access to water in housing (91%), and most of them were kept outside without access to shelter (82.1%) in an unclean and hazard-filled environment (85.9%). Absence of social interaction occurred in 20.5% and insufficient lying areas were present in 17.9% of cases.

5. Discussion

The study assessed the welfare of donkeys in northeast Algeria, an area where these animals play crucial roles in rural communities. Using the SEBWAT protocol, donkeys' welfare was systematically evaluated, revealing significant differences between the donkey's welfare state and their use. The seized donkeys used as a meat source for zoo animals had the highest scores (i.e. the worst welfare) compared to working and hobby donkeys. Negative behavioural approach towards people was detected, correlated positively with the general health state and the presence of the body lesions. Regarding the general health state, the donkeys showed eye abnormalities, lesions mostly on the head and legs, unhealthy and dirty coat, and hoof abnormalities. In the working animals, an evident lack of access to water during working and resting time was noted, as well as limited opportunities for adequate rest (shade, pasture, and safe environment).

Initially we planned to assess the welfare state in the Algerian working donkeys, but apart of those we located surprisingly high numbers of donkeys in the zoological gardens, where they were used as a meat source for carnivores. They were housed

together in one enclosure in each of the zoos, irrespectively on the sex or age of the donkeys. In contrast to working animals, animals raised for meat undergo more impersonal treatment, lacking the personalized care and attention afforded to hobby animals (Spencer et al. 2006). Some hobby farmers may develop a personal attitude to their animals as pets, in comparison to larger farms (Wilkie 2005). In zoological gardens, it is common practice to feed carnivorans with various meats, including those from cows, pigs, deer, horses (Brando & Harfeld 2014), buffaloes (Sikander et al. 2015), and even donkeys (McLean & Gonzales 2018). The origin of meat can vary geographically, with developed countries primarily relying on intensive farming systems (Brando & Harfeld 2014), while both developed and developing countries often utilize animals that have completed their productive life (Lorenzo & Carballo 2015; Deb et al. 2016; McLean & Gonzales 2018). Following informal discussion with zoo veterinarian (personal communication, June 8, 2023), donkeys in Algeria often end up in zoos as a meat source due to the smuggling operations from Algeria to Tunisia. However, these animals often experience welfare issues (Brando & Harfeld 2014), such as long transport, restricted access to water and food, and being tethered (Mshelia et al. 2017; Davis 2019). Donkeys kept for meat are prone to other welfare problems, including zoonotic diseases and inadequate care in facilities, and may be subjected to harsh processing methods such as slaughter in the bush with axes (Mshelia et al. 2017).

Differential treatment was noted among working and hobby donkeys, who obtained significantly lower SEBWAT scores (i.e. had better welfare). Working and hobby animals typically receive a more personal approach due to their crucial role in household activities, such as transportation or agricultural tasks (Pritchard et al. 2018; Brooke 2019; Geiger et al. 2020), where their well-being directly impacts daily operations (Luna et al. 2017; Davis 2019).

5.1. SEBWAT protocol

More than half of the working donkeys in the studied regions in Algeria were in poor body condition, probably thanks to limited access to water and feed, and their prevalent working regime seven days/week mostly without the possibility to get the adequate rest and gain the energy. Similarly poor condition showed the donkeys in Ethiopia, where they serve as pack animals (Aliye et al. 2022), mainly for transport of

charcoal (Kumar et al. 2014), bricks or goods by pack (Burn et al. 2010a). However, specific details regarding their working hours and feeding practices were not provided, making comparisons with other conditions challenging, similarly like for donkeys in poor condition in Botswana (Geiger & Hovorka 2015) and Pakistan (Shah et al. 2019). Generally, poor body condition in donkeys is often associated with factors such as lack of feed or supplementary feeds (Kumar et al. 2014; Ali et al. 2016; Nejash et al. 2017; Ayalew et al. 2018), overloading and overworking (Ali et al. 2016; Tsega et al. 2016; Ayalew et al. 2018), and dehydration and heat stress (Pritchard et al. 2008, McLean et al. 2012). All these factors can play a major role in donkeys in Algeria.

Prevalent health issues observed in this study encompassed a high incidence of eye abnormalities (85.9%), including discharge, wet eyelashes, ocular pain, or defects of eyes. In comparison to previous reports in donkeys, Herago et al. (2015) reported 20.9% of eye abnormalities in Ethiopia, while Teklay et al. (2019) reported 47.14% in the same region. Similarly, Hameed et al. (2016) noted eye abnormalities in 55% of donkeys in Pakistan. Ophthalmic problems can be potentially caused by diseases (Hameed et al. 2016; Teklay et al. 2019) mechanical damages (Scantlebury et al. 2013; Teklay et al. 2019), improper harness (Scantlebury et al. 2013; Fesseha et al. 2020), dusty environment (Biswas et al. 2013; Ashinde et al. 2017), and warm dry or sub-moist climate (Tadesse 2014; Ashinde et al. 2017). However, without conducting a long-term study involving the regular veterinary checks we are not able to reveal the exact cause of the eye abnormalities prevalence in Algerian donkeys.

Additionally, an increased presence of ectoparasites, namely ticks (41%) was observed in this study compared to previous reports. In Ethiopia ectoparasites infestation varied from 6 to 30 %, (Kumar et al. 2014; Herago et al. 2015; Aragaw et al. 2016), while in India, Rayner et al. (2018) reported only 0.2%. Increased prevalence of ectoparasites in our study may be linked to personally detected owners' limited knowledge about healthcare and feeding practices and absence of preventive measures. Ali et al. (2016) reported the presence of ectoparasites in donkeys in Egypt, with rates about 50% in donkeys using for cart transport. Donkeys exhibited signs of insufficient feeding, overwork, and an unhealthy, ungroomed coat, which is associated with parasitic infestations (Ali et al. 2016). Moreover, poor body condition, observed in 62.8% of the donkeys in our study, has been correlated with a higher prevalence of

parasites in previous studies (Ibrahim et al. 2011; Jajere et al. 2016; Mulwa et al. 2020). Additionally, inadequate outdoor type of management (Jajere et al. 2016), as noted in 82.1% of the donkeys in our study, along with free grazing (Mezgebu et al. 2013; Jajere et al. 2016) and shared grazing by different livestock (Nts'aoana et al. 2023), have also been associated with an increased prevalence of parasites in donkeys.

Behavioural assessments revealed higher levels of avoidance (39.7%) in the chin contact test in this study compared to previous investigations (Geiger & Hovorka 2015, Hameed et al. 2016). Ali et al. (2016) reported higher avoidance of chin contact (46.5%) for donkeys transporting bricks by cart than those transporting goods by cart (32.56%), while Farhat et al. (2020) reported 64% of donkeys also avoid chin contact. Avoiding chin contact in equids may be associated with various factors such as injury or lesions (Popescu & Diugan 2013; Hameed et al. 2016), overworking and overloading (Ali et al. 2016), improper handling (Ali et al. 2016), and poor body condition (Ali et al. 2016; Farhat et al. 2020). Additionally, younger animals exhibited better acceptance of chin contact compared to older animals, possibly due to the absence of negative experiences (Burn et al. 2010b; Popescu & Diugan 2013).

Negative reactions, such as turning the head away, moving away, laying ears back, or attempting to bite or kick during the observer's approach, were observed in 25.6% of cases, consistent with findings from other studies (Geiger & Hovorka 2015, Ali et al. 2016, Hameed et al. 2016). These negative reactions may indicate fear of humans (Dalla Costa et al. 2015) and negative experiences, such as beating (Farhat et al. 2020), overwork and overloading (Pritchard et al. 2005; Farhat et al. 2020), or unfitting harness, which can lead to wounds (Pritchard et al. 2005).

The presence of tail tucking (25.6%) aligns with observations by Hameed et al. (2016) and is contrasting with a study conducted in Portugal by Cruz et al. (2021) with reported incidence of 12.7%. Tail tucking behaviour may be attributed to negative emotional state (Minero et al. 2016), overwork (Dai et al. 2016), and beating the donkey (Pritchard et al. 2005).

In the evaluation of body lesions, the most severe lesions were observed in forelegs (23.1%) and hindquarters (15.4%), with the most common lesions occurring around the ears and head (35.9%). Additionally, tail base lesions were identified (10.3%). In contrast, Aliye et al. (2022) reported a higher prevalence of tail lesions

(24.4%) and a lower incidence of forelimb lesions (15.4%) in pack donkeys. Kumar et al. (2014) noted the most frequent wounds in the withers and back region (14.3%). This finding is not consistent with the higher incidence of withers and spine lesions (20.5%) in this study. Lesions observed in the forelegs and hindquarters may be attributed to the use of ropes for tethering in pasture settings (Mekuria & Abebe 2010). Similarly, lesions in the head and ears are likely a consequence of inadequate halters (Burden et al. 2010; Rodrigues et al. 2013). Wounds identified in the withers and spine region are likely a result of improperly fitted harnesses (Sells et al. 2010; Kumar et al. 2014; Mekete 2022) and difficult working conditions (Sells et al. 2010; Mekete 2022).

Muzzle mutilations (38.5%) were identified as the most frequent practice-induced conditions, though their prevalence was lower compared to similar study in Pakistan with 78.4% (Shah et al. 2019), while Rayner et al. (2018) reported prevalence of only 27.2% in India. It is believed that muzzle mutilation can enhance work efficiency by improving airflow; however, in reality, it results in extensive bleeding and pain (Rayner et al. 2018). The occurrence of muzzle mutilations may be attributed to cultural and identification practices (Madara et al. 2017; Sommerville et al. 2018), or for restraint and punishment (Madara et al. 2017).

Notably, this study reported a high incidence of hobbling or tethering, reaching 29.5%, consistent with documented observations by Norris et al. (2020). Conversely, Ali et al. (2016) reported tethering lesions for 10.4%, and Rayner et al. (2018) noted hobbling lesions for 13.8%. Hobbling or tethering might be due to the outdoor management of working donkeys in Algeria, where they are restrained by ropes. These practices, commonly used in low-middle income countries to constrain equid movement, frequently result in the formation of deep scars and injuries (Azelhak et al. 2023).

Abnormalities in hooves, including shape and quality, were found to be more pronounced in the forelegs, consistent with the findings reported by Fisahaye et al. (2018). Hoof problems can be caused by a lack of regular and adequate trimming, coupled with an overuse of donkeys (Reix et al. 2014, Fisahaye et al. 2018).

5.2. Adapted protocol

Additionally, various health parameters were assessed in this study, revealing that 52.6% of the observed donkeys exhibited signs of an unhealthy coat, characterized by dullness, matting, scabbiness, scurfiness, scaliness, dandruff, or balding, while 20.5% showed evidence of a dirty coat. Similar findings regarding coat health were reported by Ali et al. (2016), although they noted a higher prevalence of dirty coat, specifically 36.52% for donkeys transporting goods by cart and 58.66% for those transporting bricks by cart. Conversely, in India, Rayner et al. (2018) found a much lower incidence of unhealthy coat (18.6%). Coat condition could potentially be linked to body condition (Popescu et al. 2014), and it loses quality due to dehydration (Hameed et al. 2016), poor nutrition (Popescu et al. 2014; Heleski et al. 2015; Cruz et al. 2021), presence of parasites (Hameed et al. 2016; Miller et al. 2023), and lack of grooming of the equids (Popescu et al. 2014; Heleski et al. 2015).

In this study, hard (14.1%) and bleeding (3.8%) mouth corners were noted, potentially caused by use of improper halters, bits, and handling techniques. Similar observations have been reported in horses, where the use of bits has been associated with bleeding mouth corners and mouth pain (Uldahl & Clayton 2019; Mellor 2020). State of the mouth corners is considered an important parameter in evaluation of pain in donkeys (Van Dierendonck et al. 2020). The occurrence of mouth corner injuries and hardness may be attributed to the use of unsuitable materials, incorrect sizing, and attachment methods (Pearson et al. 2003).

Regarding working conditions, it was found that all the donkeys in this study had limited access to water (100%) and shade (33%), similarly as reported by Norris et al. (2020). However, access to shade was frequently even non-existent (52%). Working donkeys in this study were typically used for transporting water, owners generally allowed them access to water only once per day at the watering trough, where shade was typically unavailable. Working hours were six or less hours per day, seven days per week, which aligns with observations in Egypt by Farhat et al. (2020) but is less than the working hours reported for Nepalese brick kilns, where donkeys worked for six to nine hours per day, six days per week (Norris et al. 2020). In Ethiopia, donkeys typically work for between two and four hours per day (Aliye et al. 2022). Working hours can vary depending on the type of work performed. For instance, the daily

transport of water is essential for communities, as well as use of donkeys in tasks such as brick kilns, which contribute to household income (Norris et al. 2020).

Regarding housing conditions, the majority of donkeys in this study had limited access to water (91%), with most being kept outside without access to shelter (82.1%). This finding contrasts with observations made by Norris et al. (2020) in Nepalese brick kilns, where they noted 69.5% of donkeys were kept indoor, with none were kept outside. Furthermore, an unclean and hazard-filled environment was observed in 85.9% of cases, in line with finding by Farhat et al. (2020). The studied donkeys lived in an environment containing faeces and sharp objects. The absence of social interactions with another donkey occurred in 20.5%, while Cruz et al. (2021) reported that only 3,59% of donkeys in Portugal had no contact with another animal. In this study, the owner usually has only one donkey, which is housed alone. Insufficient lying areas were present in 17.9% of cases; Norris (2020) noted a much higher number, 55.9%, probably caused by indoor housing. In the pasture, there was usually a suitable area for the donkey to lie down, although in some cases, it lay in faeces.

In summary, donkeys from brick kilns in Nepal (Norris et al. 2020), Egypt (Ali et al. 2016; Farhat et al. 2020) and India (Kubasiewicz et al. 2023) have faced similar challenges such as limited access to clean water and shade, poor housing conditions including dirty and wet bedding, poor nutrition, as well as swelling and injuries from harnesses, beating, hobbling, and tethering. Similarly, donkeys serving as pack animals in Ethiopia (Aliye et al. 2022) and Nigeria (Mshelia et al. 2023) have encountered same issues, along with poor body condition, lameness, and showed behavioural changes such as depression or anxiety. Moreover, draught (cart) donkeys in Ethiopia have exhibited higher prevalence of wounds compared to pack donkeys, attributed to poorly fitting harnesses and self-trauma from wheels and breeches (Herago et al. 2015; Tesfaye et al. 2016). Ethiopian draught donkeys have also shown a higher proportion of poor body condition compared to pack donkeys, attributed to heavier workload and inadequate feeding (Mekuria & Abebe 2010; Amante et al. 2014).

5.3. Recommendations

The results of this study highlight the problems of donkey welfare and possible solutions:

a) The animal which are used as a meat source in the Zoos should be regularly checked for diseases and vaccinated, the unlimited access to water and feed should be guaranteed.

b) Water: It is suggested to improve access to water and shade during work and rest periods, as well as in housing, as water is a basic necessity for life. Donkeys working in hot environments may consume up to 20l of water daily, displaying the capacity for rapid rehydration by ingesting 20-30l within a short period (Heleski et al. 2015). The daily water intake rate, expressed as a percentage of body weight, would be twice as high during the hot season compared to the cooler months, specifically 5% versus 9% of body weight (Mueller et al. 1994). Furthermore, aside from temperature, water intake is influenced by nutritional factors when animals refuse food either due to a diminished appetite or limited food availability (Freeman et al. 2021).

c) Nutrition: In terms of nutrition, it is suggested to provide donkeys with adequate nutrition based on their type of work. Compared to other equids, donkeys have lower energy and protein requirements, and while mineral and vitamin needs have not been completely determined, it is advisable to ensure a balanced intake (Martin-Rosset 2018). For non-working donkeys, a diet primarily consisting of straw supplemented with hay or legume greens is recommended, while working donkeys should receive additional energy sources such as legume concentrates, roots, or tubers (Martin-Rosset 2018, Bell & Burden 2023).

d) Housing: Adequate housing or shelter is essential for ensuring the safety and well-being of donkeys, offering protection against insects and harsh weather conditions. Donkeys exhibit shelter-seeking behaviour, particularly in in hot and dry climate (Haddy et al. 2020b). The shelter should afford sufficient space for donkeys to lie down comfortably, as well as to access feed and water. According to Rodrigues et al. (2020), recommended housing dimensions vary based on the height of the donkey: 4.7m^2 for those with a height of less than 95 to 115cm at

the withers, 7.5m^2 for those less than 149cm, and 9.4m^2 for those over 150cm in height. Donkeys often form pair bonds, so it is beneficial to house them together to facilitate social interaction (NEWC 2009). Moreover, bedding should be kept clean and dry to promote comfort and hygiene levels (NEWC 2009).

e) Hoof health: Hoof shape has a significant impact on an animal's mobility, potentially limiting its ability to move freely and comfortably. Overgrown hooves increase the risk of over-reaching, where the hind limbs may strike the heels of the forelimbs (Thal 2015). Corrective farriery techniques can alleviate interference problems by trimming hoof length, thereby reducing the risk of over-reaching, trimming should be done every 6-12 weeks (Brooke 2013). However, it is crucial to exercise caution during the trimming process to avoid excessive removal of the hoof wall, as this can result in pain and lameness (Brooke 2013).

f) Handling: Understanding donkey behaviour and employing safe handling techniques are essential parts of welfare. Securing the head with a halter or headcollar is the initial step in gaining control (Fraser 2010). However, if handlers are aggressive towards donkeys, they may exhibit aggressive behaviour or fear responses, such as moving away, leading to escalating conflicts (Norris et al. 2020). Aggressive treatment of animals is linked to a higher risk of mistreatment and poorer welfare standards (Burn et al. 2010a; Ali et al. 2019). Conversely, the positive attitude of handlers towards their donkeys contributed to better welfare and more relaxed behaviour in animals (Rayner et al. 2020).

g) Working: Donkeys should be provided with regular rest breaks, during which equipment can be removed to allow them to cool down, stretch, or lie down. This practice also offers a reprieve for wounds, reducing continuous interference throughout the working day (Norris et al. 2020).

6. Conclusion

This study offers valuable insights into enhancing the welfare of donkeys in Algeria. To our knowledge, this is the first study that explored the welfare status of donkeys in northeast Algeria. The assessment conducted using the SEBWAT revealed significant welfare issues prevalent among donkeys, with significant differences between working and hobby donkeys and donkeys used as a meat source, including poor body condition, eye abnormalities, ectoparasites, and behavioural issues. These findings underscore the urgent need for interventions to improve the welfare conditions of donkeys in the region. Suggested measures involve improving the availability of water and shade during both working hours and rest periods, alongside upgrades to housing facilities and removing equipment during breaks to ensure adequate rest for donkeys. Collaborative efforts involving donkey owners and handlers are essential to instigate positive changes in attitudes and practices towards donkey welfare. Furthermore, the study highlights the effectiveness of the SEBWAT protocol in assessing donkey welfare, providing valuable insights for future research and intervention programs. By addressing the identified welfare challenges and implementing appropriate solutions, stakeholders can work towards enhancing the overall welfare and health of donkeys in Algeria, thereby improving their work efficiency and quality of life.

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Appendices

List of the Appendices:

Table SM1. SEBWAT scoring criteria: Descriptors.

Parameter	Description	Scoring criteria
Date	Date of assessment	N/A
Time	Time of assessment	N/A
Locality ID	Number of locality	N/A
Animal ID	Number of animal	Optional
Owner ID	Number of owner	Optional
Work type	Transport	The donkey carries items on its back in a pack, pack saddle, baskets or saddle bags or the donkey is ridden
	Hobby	Donkey does not do any work, kept as a pet
	Meat source	Donkey is used as a meat source for carnivorans
Sex	Stallion	An entire male
	Mare	A female

Table SM2. SEBWAT scoring criteria: General health (modified).

Parameter	Score	Description	Scoring criteria
Eyes	0	No abnormality	No abnormality in either eye, or only slight imperfections
	1	Moderate abnormality	Excessive tears or opaque liquid discharge extend beyond the corner of the eye or accumulated over the eyeball, red conjunctiva, or abnormal third eyelid is visible in one or both eyes
	2	Severe abnormality	Opacity, missing eye, eye fully or more than halfway closed, clear swelling of eyelids or conjunctiva; abscess, ulcers, lesions, deformity on the eyeball or within 2cm around the eye; or blood-stained discharge is visible in one or both eyes
Nasal discharge	0	None	No discharge, or only transparent liquid
	1	Discharge present	Opaque or blood-stained discharge is present in one or both nostrils
Respiratory noise	0	Not audible	Cannot hear breathing and there are no noises associated with breathing
	1	Audible	Can hear the animal breathing, or there are any respiratory noises when the animal inhales and/or exhales
Diarrhoea	0	None	No clear evidence of diarrhoea
	1	Diarrhoea present	Clear evidence of diarrhoea, or if diarrhoea is observed when defecating
Ectoparasites	0	None	No bot eggs, lice, lice eggs or ticks are seen on any part of the body
	1	Ectoparasites present	Any number of bot eggs, lice, lice eggs or ticks are present on the animal
Body condition	0	Normal	Neck straight; point of shoulder not clearly visible and joins the body smoothly; spine slightly visible at withers but smooth elsewhere; ribs not visible; pelvis well filled and slightly rounded; tail-head slightly visible, but well filled and joins the rump smoothly
	1	Thin	Neck concave or straight; pelvis flat; shoulder point, spine, ribs, hooks, pins and tailhead are visible
		Fat	Neck slightly convex; some fat accumulation behind shoulder; slight `gutter' along spine; some fat accumulation over ribs; pelvis well rounded or slightly `heart-shaped'; some fat accumulation over tail-head
	2	Very thin	Neck concave; pelvis hollow; shoulder point, spine, ribs, hooks, pins, and tail-head are prominent
		Very fat	Neck distinctly convex; fat accumulation behind shoulder clearly visible; fat accumulation on either side of spine with a distinct `gutter'; fat accumulation clearly visible over ribs; pelvis distinctly rounded (clearly `heart-shaped'); fat accumulation clearly visible over tail-head

Table SM3. SEBWAT scoring criteria: Behaviour.

Parameter	Score	Description	Scoring criteria
Observer approach	0	Positive	Equid is not afraid of the approaching observer, and is alert, friendly or relaxed, but not nervous or apathetic
	1	Neutral	Equid is apathetic, dull, or non-responsive, and has no interest in the approaching observer
	2	Negative	Equid is anxious, frightened, or aggressive in response to the approaching observer
Chin contact	0	Accepts contact	Equid calmly allows the chin to be touched
	1	Avoids contact	Equid withdraws the head when contact with the chin is made, or as the hand is approaching the chin
Tail tuck	0	No tail tuck	Equid does not show any signs of tail tuck whilst assessor is walking towards or around the hindquarters
	1	Tail tuck	Equid tucks the tail between the hind limbs, clamps down the tail, and/or tucks in or tenses the hindquarters at any time whilst you are walking towards or around the hindquarters
General attitude	0	Positive	Equid is not afraid, and is alert, friendly or relaxed, but not nervous or apathetic throughout the majority of the assessment
	1	Neutral	Equid is apathetic, dull, or non-responsive throughout the majority of the assessment
	2	Negative	Equid is anxious, frightened, or aggressive throughout the majority of the assessment
Spinal contact	0	No reaction	Equid shows no clear reaction when contact with the spine is made
	1	Reaction	Equid shows visible tensing of the muscles of the back or neck, flinching of the part of the spine being touched, or clear movement of parts of the body other than the area being touched when contact with the spine is made

Table SM4. SEBWAT scoring criteria: Body lesions.

Parameter	Score	Description	Scoring criteria
Severity	0	None	No lesion in the specified Body Area, or there are only severity score one lesions of less than the minimum qualifying size of 4 sq cm
	1	Superficial or healed lesion	Superficial or healed lesion, including hairless skin, which may be pale pink if partially broken, scabs, or scar tissue greater than 4 sq cm
	2	Open lesion	Lesions where the skin and immediate subcutaneous layers are broken, including visible red tissue, dried or fresh blood, granulation tissue, lesions showing pus, or lesions which appear moist due to fluids seeping from the skin
	3	Deep lesion	Lesions deep enough to show muscle, tendon, or bone
Size	0	None	No lesions or the lesions affect less than 4 sq cm of the skin surface in the specified body area
	1	Small	Lesions affect between 4±16 sq cm of the skin surface
	2	Medium	Lesions affect between 17±64 sq cm of the skin surface
	3	Large	Lesions affect more than 64 sq cm of the skin surface

Table SM5. SEBWAT scoring criteria: Practice-induced conditions.

Parameter	Score	Description	Scoring criteria
Mutilations: Tail, Ear, Muzzle	0	None	No mutilation of specified body part
	1	Healed	Mutilation of specified body part present, completely healed without broken skin
	2	Recent	Wound from mutilation of specified body part present, not healed with broken skin of any severity
Firing lesion	0	None	No firing lesions on the whole animal
	1	One area	Firing lesions are present in one Body Area
	2	Few areas	Firing lesions are present in two or three Body Areas
	3	Many areas	Firing is present in more than three Body Areas
Firing lesion: Severity	0	None	No lesions on the whole animal
	1	Healed lesion	Healed lesions. This includes scar tissue (which may be hairless areas of white, pink, grey or black skin), and scars covered with white hairs
	2	Open lesion	Lesions where the skin and immediate subcutaneous layers are broken. This includes visible red tissue, dried or fresh blood, and granulation tissue
	3	Deep lesion	Lesions deep enough to show muscle, tendon, or bone
Hobbling lesion: Severity		Horizontal hobbling lesions, severity scored as for "Firing lesions"	

Table SM6. SEBWAT scoring criteria: Hooves and limbs.

Parameter	Score	Description	Scoring criteria
Gait	0	Not compromised	Walks with even, regular strides, and ability to walk is not compromised. Motion does not need to be perfect
	1	Moderately compromised	Shows some irregularity or inconsistency of gait, and ability to walk is moderately compromised
	2	Highly compromised	Shows clear limping with every stride on the affected limb/s, but is able to bear weight
	3	Unable to bear weight	Severe lameness, and cannot bear weight on one or more limbs
Lower limb swelling (Fore/hind)	0	None	No swelling which clearly distorts the shape of the flexor tendons or fetlock joint on either of the fore limbs
	1	Swelling in one limb	Clear swelling in one limb
	2	Swelling in both limbs	Clear swelling in both limbs
Interference lesions (Fore/hind)		Lesions caused by brushing are found on the inner aspect of fetlock joints and pasterns, on fore limbs or hind limbs. Lesions caused by over-reaching are found on the heels of the fore limbs only. Severity scored as for `Firing lesions'	
Hoof shape (One score for fore, one for hind hooves)	0	No abnormality	No or mild abnormality in both hooves
	1	One hoof abnormal	Clear abnormality in one hoof (toes too long or heels too long or low, wall concave or convex)
	2	Both hooves abnormal	Clear abnormality in both hooves
Hoof quality (one score for fore, one for hind)	0	No abnormality	No or slight hoof wall damage (nail holes, cracks or breakage affecting <2cm of hoof wall) in both hooves
	1	One hoof abnormal	Hoof wall damage in one hoof
	2	Both hooves abnormal	Hoof wall damage in both hooves

Indicator	Parameter	Score	Description	Scoring criteria
Health	Coat health	0	Healthy	Flat, smooth, sleek coat
		1	Unhealthy	Dull coat in which some or all of the hair is or has matted, scabby, scurfy, scaly, dandruff, balding
	Coat cleanliness	0	Clean	No dirt was found on the tips of the observer's fingers
		1	Dirty	Dirt was found
	Mouth corners	0	Normal	No evidence for wounds, fissures, and redness of the tissue of the mouth corners
		1	Hard	Evidence for wounds, fissures, and redness of the tissue of the mouth corners
		2	Bleeding	Evidence for wounds, fissures and redness of the tissue, bleeding mouth corners
Working	Access to water – working	0	Free access	Free access to water during working period
		1	Limited access	Limited access to water during working period
		2	No access	No access to water during working period
	Number of working hours per day	0	Good	Less than or equal to 6h
		1	Medium	More than 6, less than or equal to 9h
		2	Bad	More than 9h
	Number of days worked per week	0	Good	5 days or less
		1	Medium	6 days
		2	Bad	7 days
	Rest breaks during working day	0	Good	Yes, equipment removed
		1	Medium	Yes, equipment not removed
		2	Bad	No
	Access to shade during breaks in working	0	Good	Access to shade
		1	Medium	Limited access to shade
		2	Bad	No access to shade
Housing	Access to water – housing	0	Free access	Free access to water in housing
		1	Limited access	Limited access to water in housing
		2	No access	No access to water in housing
	Social interaction	0	Social contact	Donkey is housed with other donkeys or, if housed singly, physical contact with other donkeys is always accessible
		1	No social contact	Donkey is isolated from other donkeys, no physical contact with any other donkeys
	Housing regime	0	Good	Stabled donkey – access to field
		0	Good	Kept outside – access to shelter
		1	Medium	Indoor housing
		2	Bad	Kept outside – no access to shelter
	Dimensions of the stable/shelter	0	Good	Satisfactory
		1	Bad	Non-Satisfactory
	Clean, dry comfortable lying area	0	Good	Yes
		1	Bad	No
	Environment clean and free from hazards	0	Good	Environment is clean, dry, without excess dust and without hazards – etc. unsuitable rocky terrain, traffic, disease transmission, predators
		1	Bad	Environment is dirty, muddy, with excess dust and with hazards – etc. unsuitable rocky terrain, traffic, disease transmission, predators

Table SM7. Adapted protocol scoring criteria (based on studies by Wageningen UR Livestock Research 2011; Minero et al. 2015a, 2015b; Ali et al. 2016; Norris et al. 2020).